

## Periscope.

### a.—ANATOMY AND PHYSIOLOGY OF THE NERVOUS SYSTEM.

FUNCTIONS OF THE BRAIN.—Dr. Otto Soltmann publishes in the *Jahrb. f. Kinderheilk.*, IX., 2, p. 106, a more extended account of his researches in regard to the functions of the cerebral cortex and ganglia in very young animals than was given in his communication to the *Centralblatt*, reported in the Periscope of our October number of last year. He gives a very thorough discussion of the subject, with a description of his method of experimenting, and sums up the results as follows :

1. No muscular movements were produced by the electrical irritation of the cerebral cortex in newly-born animals.

2. They were first observed in puppies about the tenth(?) day after birth, and in their appearance they observed the following order : first, motions of the opposite anterior extremity, then that of the opposite posterior one, and the facial (optic) muscles.

3. The circumference of the cortical motor centres is greater in very young animals than in older ones. As the number of the motor centres increases, they become more narrowly defined, and correspond to those fixed by Hitzig.

4. The extirpation of the cortex of the anterior lobe causes no motor disturbance in newborn and ten-days-old puppies, neither at the time or later. (The corresponding lobe of the opposite hemisphere seems to act vicariously for the one ablated.) The extirpation of the anterior lobe in older animals is accompanied with a paralysis of the muscular sense, the more pronounced the older the animal.

5. The extirpation of the cortical portion of both anterior lobes produces in newborn animals, neither at the time nor later, any motor disorder. The extirpation of the same in adult dogs is accompanied by bilateral ataxia.

6. The corpus striatum has no motor function in the newborn.

7. Contraction in the opposite anterior member is produced in newborn puppies by electrical irritation of the fibres of the internal capsule. The exact locality from which is produced this result varies according to the age and the individual ; it is sometimes more superficial than at others. It is most certainly produced by irritation of that part of the fibres of the internal capsule which lie between the corpus striatum and the optic thalamus, whence they pass out to enter the white substance of the hemispheres. The irritation in no case causes movements of the opposite posterior member, or of other muscles.

The author finishes his paper with a lengthy discussion of the points developed by his experiments, the application of the facts observed in experiments on animals to the human infants, and their bearing on practical medicine. The fact that no motor centres exist in the newborn animals shows that the nervous phenomena at that age are altogether spinal and reflex in their nature. The reason why the extent of the first appearing motor centres is greater than at a later period is not easy to explain, but the author suggests that it may perhaps be accounted for by the manifold commissural connections between the different parts of the cortex. If only the conception of movement of the fore foot is present in the mind, so to speak, an irritation of parts adjoining its special motor centre may have no other motor result.

The significance of the extirpation experiments, the results of which are given in the above conclusions, is also not clear; but, as stated there in respect to the ablation of a single lobe in newly-born dogs, the author is inclined to suspect in the other cases also a vicarious function of other parts; in some cases possibly the cerebellum.

As to the practical bearings of these observations, the first point mentioned is the light they throw on the pathogenesis of convulsions. Dr. Soltmann indeed takes as a text for his researches the statement of West in regard to the predominance of the spinal over the cerebral system in early life, and the consequent lack of the inhibitory influence of the higher centres. Then this lack of development of the functions of the brain in the newly-born accounts for the fact that so many brain diseases may be latent without characteristic symptoms at that period.

The paper closes with a tabulated analysis of the experiments, occupying some ten pages.

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DECUSSATION OF THE OPTIC NERVES.—Reich, *Jour. Russe de Med. Militaire*, 1875 (abstracted in *Rev. des Sci. Med.*), has repeated the experiments of Gudden (enucleation of one eye and examination of the optic nerve, the chiasm and the optic tracts after a certain period of time) on young dogs. At the end of a month he observed the occurrence of an atrophy, not only in the nerve of the eye enucleated, but also in the chiasm and the optic tract. At the end of five months there was evident atrophy of the two optic tracts; both were less voluminous and less prominent than in the normal condition.

The tract of the side opposite to the eye enucleated was not much more slender than the other. These modifications were also verified by the microscope. These results, which prove so clearly the incomplete decussation of the optic nerves in the dog, agree with the recent researches of Gudden.

Reich insists on the difficulty, or rather the impossibility, of refuting, from the examination of specimens, the theory of the incomplete decussation in man; to decide the question absolutely by the dissociation of the fibres is equally difficult. According to him, the mode of decussation in chiasm in man is still unknown, and its incompleteness is not unlikely. Vision in the dog has some analogies with ours, but a comparison with that

of the rabbit, in which the visual fields are absolutely distinct, is altogether inadmissible.

The question must be tested by means of anatomical preparations taken from individuals in whom atrophy of one optic nerve has existed for many years.

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THE DECUSSATION OF THE OPTIC NERVES.—J. Hirschberg, *Virchow's* LXV., 116, gives an account of a case of right lateral hemiopia, with aphasia and right hemiplegia, in consequence of a tumor in the left temporal lobe. The left optic tract was noticeably wasted. In order to account for this sharply-defined hemiopia, according to the theory of a complete decussation of the optic fibres, it would be necessary to assume a very exactly limited local lesion in the left angle of the chiasm, or two symmetrical ones in each half of the brain, conditions which were not all met with in the autopsy. Any convenient lesion affecting the conduction of the optic tract would account for the phenomena, and this was the condition found at the post-mortem.

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WHAT ARE THE PACINIAN CORPUSCLES?—Arndt, *Virchow's Archiv*, LXV., 1, 131, disputes the commonly received opinion that the Pacinian bodies are the terminations of the sensory nerves, and gives them another signification, which he holds is confirmed by the recent investigations of Przewoski concerning the oedematous enlargement of these corpuscles. (*Virchow's Archiv*, LXIII., 363.) He has examined them in their development and afterwards in the mesocolon of the cat, and concludes that they have scarcely any connection with sensation, but that they are connected, in all probability, with the vaso-motor nerves, being terminal modifications of the same in the vascular walls. In the light of these researches, they appear to have something of a pathological character, being probably produced by abnormal conditions during development, and Arndt therefore mentions their greater frequency in the insane as interesting and suggestive in this connection.

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RECURRENT SENSIBILITY.—M. Richet, *L'Union Medicale*, Aug. 21, offers the following explanation of the phenomenon of recurrent sensibility in the nerves of the hand, as exhibited after their division :

The nerves of the hand, he says, instead of terminating like the other nerves, present a special disposition which M. Ch. Robin was the first to notice. The terminal nerve fibres from the median, the radial and the ulnar nerves unite at their extremities, forming loops or arches. From these loops other smaller fibres, only  $\frac{1}{10}$  of a millimetre in diameter, depart, and after a short course end in the tactile corpuscles. Each of these corpuscles, therefore, receives fibres coming from the anastomotic loops of the ulnar or

radial with the median nerve. Thus it is that the section of one of these nerve trunks is insufficient to produce insensibility in these corpuscles, the essential organs of touch.

To explain the sensibility of the peripheral portion of the divided nerve itself, we must allow that a certain number of sensitive fibres, either from the radial or the ulnar nerve, following the course of the anastomoses indicated by M. Robin, by a recurrent track, are sufficient to maintain the sensibility in the portion of the nerve below the section, or at least not to suppose that this sensibility is always due to the *nervi nervorum* discovered by M. Sappey—a rather improbable theory. The nerves of each face of the hand and thumb, therefore, receive fibres from those of the opposite face terminating in the same part of the integuments, besides those from certain anastomoses of the median with the cubital for example. We may say, therefore, that in the hand, the special organ of tact, the division of general and special sensibility, the nervous circulation, if I be allowed the expression, is as well provided for as the arterial circulation.

These facts which I first announced in 1867, were then the subject of animated discussions—they were so much opposed to received opinions, and they were at first declared incorrect. Then MM. Letievent and Boeckel published two observations of the kind, and I have myself since observed and published two cases which illustrate these points. The foreign papers, especially the English and American ones, have reported many others. Finally the definite confirmation of these views is afforded by the beautiful memoirs of MM. Arloing and Tripier, going back to the year 1869, which have received the prize of the Academy.

We have seen, therefore, that there is not, as has been supposed, an immediate reunion of the nerves with the passage of nervous influence across the cicatrix. I have shown, on the other hand, that there is a manifestation of a normal pre-existing anatomical disposition, of which physiologists have not taken enough account, and which has only very distant relations, if any, to the facts of recurrent sensibility discovered by Magendie in the posterior roots.

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THE SPINAL AND MEDULLARY CENTRES.—Dr. Carl v. Schroff, Jr. in a paper in *Stricker's Jahrb.*, 1875, III. Hft., discusses the arrangement and location of the vaso-motor, the respiratory and the cramp centres in the medulla and cord, and publishes the results and details of some of his own experiments performed to test these questions. He experimented on rabbits and dogs, dividing the cord at the occipito-atloid point, and keeping the animal thus operated upon in a warmed chamber or chest, the temperature of which was carefully regulated according to a thermometer by a system of copper rods heated by small gas burners. In the case of the dogs, narcotization by morphia or curare was employed; the rabbits were not narcotized in any way whatever. The grounds on which these methods were employed were partly the increase of irritability of the severed cord with the increase of temperature noted by Afonaisieff, and partly other reasons which are promised in detail in a more extended work to be published in the future.

The results of the experiments in regard to the vaso-motor centres indicated that there existed in the cord, separated from the medulla, excitable centres acting on the blood-pressure, since while suppression of the respiration caused only a very slight increase as indicated on the registering instrument (at most only 18 millimetres), the re-establishment of the same caused a very rapid increase. In one instance the blood-pressure rose in nine seconds from 62 millim. to 115 millim.; in another from 88 to 176 millim.; and in still another from 40 to 150 millim., etc.

In regard to the respiratory centres, von Schroff's experiments in the main support the statements of P. Rokitsansky, that respiratory movements can still be induced after section of the medulla at or a little posterior to the angle of the *rautengrube*, but he adds that the centres that still remain after this operation are very quickly exhausted, two or three deep inspirations sufficing to render them powerless.

The experiments on the convulsive centres indicated that such existed below the pons and the medulla, capable of arousing spasms either in a reflex way or through the chemical action of the blood, and that the theory of Nothnagel that these centres were confined to the pons is incorrect.

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**ÆSTHESIOGRAPHY.**—M. Leudet read a paper of M. Letieuvant at the recent (Nantes) meeting of the French Association for the Advancement of Science (reported in *Revue Scientifique*) on æsthesiography. By his numerous minute researches he had been able to divide the surface of the human body into from forty-two to forty-four distinct regions, each marked by a special character of sensibility. Nine of these regions were counted on the upper extremities, eleven on the lower, and ten on the face. We can readily appreciate the importance of this determination both in a physiological and pathological point of view. The limitation of these regions is very positive and clear. We must not conclude, nevertheless, that if the nerve supplying one of these regions is destroyed or injured, all sensibility will then be lost. In fact, on the border of each of these regions the nerves are capable of sending out filaments into the others, and we must keep this fact in mind in calculating the consequences of circumscribed neurotomies and neuralgias.

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**THE SENSORY ROUTES IN THE SPINAL CORD.**—Woroschiloff, *Ludwig's Arbeiten*, 1875, publishes the results of a series of very careful experiments illustrated by numerous heliograph illustrations. By means of a rather elaborate apparatus, he was able to make any desired section of the cord. The result of these investigations seems to be that the lateral columns contain both motor and sensory fibres; that the action of these latter is crossed for the anterior part of the body, but not equally so in all parts of the lateral column, being most pronounced in the fibres of its middle third. Motor fibres are also present in these columns for the same parts of the body.

Irritation of sensitive surfaces situated in front of the lesion of the cord only produced reflex actions in the limbs on the side of which at least a part of the lateral column was intact; if it was entirely destroyed, it was impossible to cause reflex movements in the hinder limbs, no matter how strongly the fore foot or ear of the corresponding side of the animal was irritated. But not every unwounded section of the lateral columns sufficed to permit reflex movements: the anterior half was required to be intact.

Co-ordinated movements such as those of sitting or springing required the integrity of the middle third of the lateral columns.

Electrical irritation of the cervical cord below the calamus scriptorius caused repeated alternating flexion, or extension, or tetanic contraction of the limbs. For the first the integrity of the middle third of the lateral columns was required; the second occurred even when the whole of the corresponding lateral column was destroyed. The tetanizing fibres for both limbs are therefore contained in each lateral column, but if one of these is totally severed with the anterior two-thirds of the other one, the tetanus is confined to the side on which a portion yet remains.

The result of all the experiments is to show that the lateral columns contain both sensory and motor fibres intermixed, and to confirm Meynert's views as to the reference of these columns to his second projection system, carrying impulses, sensory and motor, from the cerebral ganglia to the spinal centres, and *vice versa*.

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THE SINEW REFLEX.—Erb and Westphal have recently called attention to the peculiar reflex phenomena of contraction of certain muscles caused by percussion of sinews, and notably by that of the tendon of the quadriceps femoris, or of the patella. This is well seen in healthy persons, but is still more noticeable in certain diseased conditions lately described by the former author, who considered them as reflex, while Westphal thought them only the result of mechanical irritation of the sinews, inducing a stronger irritation of the muscular fibres.

Drs. Schultz and Fuerbringer, of Heidelberg, have lately published (*Centralblatt f. d. med. Wissensch.*, No. 54) experiments in regard to this subject. They operated on rabbits by laying bare the muscles and tendons involved, and observing the effects on this phenomenon of division of the various nerves supplying the parts; in two experiments, dividing the cord in the dorsal region, and in one also severing the tendon and holding the muscle slightly stretched by a hook or needle, and then applying percussion and producing the phenomenon. They also curarized a rabbit, and found that with the cessation of the faradic irritability of the crural nerve, the symptom also ceased, though the mechanical and faradic muscular irritability was still retained. From the results of these experiments, they feel authorized to assume that (1), the phenomena in question are not to be attributed merely to mechanical muscular contraction excited through the sinew; (2), that it was rather a reflex excited through mechanical irritation of the tendon, traveling over the reflex arch for the lower extremities; (3), that it is not a cutaneous reflex in the sense used by Joffroy.

MUSCULAR CONTRACTILITY.—M. Onimus has had the opportunity of examining the muscles of a decapitated criminal shortly after death. He found that two hours after execution the right auricle beat spontaneously. The ventricle was quiescent, but the slightest stimulus applied to it caused it to contract. After the lapse of five hours, constant currents applied to the skin caused contraction of the subjacent muscles, though the same stimulus applied directly to the nerves no longer induced contraction.—*Lancet*, January, p. 47.

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Among the recent papers in this department we may mention the following :

FLECHSIG, on the Development of the Central Nervous System, *Centralbl. f. d. med. Wissensch.*, No. 40, 1875 ; EXNER, Experimental Researches on the Simplest Psychic Processes, *Pflueger's Archiv*, Sept. 30.

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